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[Claim(s)]

[Claim 1] From the actuation temperature of heat actuation heat pump and this heat actuation heat pump, a low-temperature heat source, In the heat pump system equipped with the compression equation heat pump which takes heat from the above-mentioned heat source, pumps up to the above-mentioned actuation temperature, and is passed to the above-mentioned heat actuation heat pump When direct ****** is held in the above-mentioned heat source and the ends of this direct ****** stand in a row in the interior space of the evaporator of the above-mentioned compression equation heat pump The heat pump system characterized by being returned to an evaporator after the refrigerant of the above-mentioned compression equation heat pump is led to the above-mentioned direct ****** from the above-mentioned evaporator and carries out direct **** from the above-mentioned heat source.

[Claim 2] The heat pump system according to claim 1 characterized by the above-mentioned refrigerant being water.

[Claim 3] The heat pump system according to claim 1 which the above-mentioned refrigerant is the condensation nature fluid which becomes the liquid phase by room temperature ordinary pressure, and is characterized by mixing non-condensable gas in this condensation nature fluid.

[Claim 4] The heat pump system according to claim 3 characterized by the above-mentioned non-condensable gas being air.

[Claim 5] The heat pump system given in any [Claim 1 -] of four they are with which the pressure of the above-mentioned evaporator is characterized by being set up becoming higher than the maximum vapour tension to the temperature of the refrigerant after **** from the above-mentioned heat source.

[Claim 6] The heat pump system given in any [Claim 1 -] of five they are characterized by the above-mentioned heat source being a fuel cell.

[Claim 7] The heat pump system given in any [Claim 1 -] of five they are characterized by the above-mentioned heat source being a solar collector.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to heat pump systems pump up low-temperature heat by compression equation heat pump comparatively, and make it an elevated temperature, and it was made to drive heat actuation heat pump, such as a fuel cell and a solar collector.

[0002]

[Description of the Prior Art] For example, the heat pump system of the description equips JP,S55-60160,A with a low-temperature heat source, compression equation heat pump, and an absorption type heat pump (heat actuation heat pump). The heat exchanger is held in the evaporator of compression equation heat pump, and the ends of this heat exchanger are connected to the low-temperature heat source. By this, a heat carrier circulates between a low-temperature heat source and a heat exchanger. When this heat carrier carries out heat exchange to the refrigerant in an evaporator in a heat exchanger, the heat of the source of low warm temperature which is low temperature comparatively is received and passed to a refrigerant. Compression equation heat pump obtains hot heat by evaporating the above-mentioned refrigerant one by one, and compressing and condensing it (that is, the heat of the above-mentioned low temperature is pumped up). An absorption type heat pump drives with this hot heat.

[0003]

[Problem to be solved by the invention] In the conventional system of upper **, a heat carrier is won popularity and passed first, and the heat of a low-temperature heat source is transmitted to the peripheral wall of a heat exchanger from this heat carrier, and is received and passed to the refrigerant in an evaporator. For this reason, there was a problem that ******** of a refrigerant fell.

[0004]

[Means for solving problem] This invention was made in view of the above-mentioned situation, and is equipped with heat actuation heat pump and the compression equation heat pump which takes heat from a low-temperature heat source and the low-temperature above-mentioned heat source, pumps up to the above-mentioned actuation temperature, and is passed to the above-mentioned heat actuation heat pump from the actuation temperature of this heat actuation heat pump. The above-mentioned heat sources are a fuel cell and a solar collector, for example. Direct ****** is held in this heat source, and the ends of this direct ******

stand in a row in the interior space of the evaporator of the above-mentioned compression equation heat pump. Thereby, after the refrigerant of the above-mentioned compression equation heat pump is led to the above-mentioned direct ****** from the above-mentioned evaporator and carries out direct **** from the above-mentioned heat source, it is returned to an evaporator.

[0005] As for the above-mentioned refrigerant, it is desirable that it is the condensation nature fluid which becomes the liquid phase by room temperature ordinary pressure, such as water. It is desirable to mix non-condensable gas, such as air, in this condensation nature fluid.

[0006] It is desirable to set up the pressure of the above-mentioned evaporator from the above-mentioned heat source to become higher than the maximum vapour tension to the temperature of the refrigerant after ****. Furthermore, it is desirable to set up to become higher than the maximum vapour tension to the highest temperature in a heat source. Thereby, a refrigerant does not boil in a heat source but ******** can be certainly made high.

[0007]

[Mode for carrying out the invention] The embodiment of this invention is hereafter explained with reference to Drawings. Drawing 1 shows the heat pump system S1 concerning the 1st embodiment of this invention. The heat pump system S1 is equipped with the absorption type heat pump 10 as heat actuation heat pump, the fuel cell 30 as the actuation heat source, and the compression equation heat pump 20 that intervened among these apparatus 10 and 30.

[0008] The absorption type heat pump 10 has four vessels 11-14 connected annularly. A lithium bromide solution (absorption solution) is stored in an absorber 11, and water (refrigerant for absorption type heat pumps) is stored in the evaporator 14. And the water of an evaporator 14 evaporates in the lithium bromide solution of an absorber 11, and is absorbed. An evaporator 14 is cooled by this and cooling etc. is presented.

[0009] The lithium bromide solution diluted by water absorption is sent to a regenerator 12 through the heat exchanger 16 from an absorber 11 by the solution circulating pump 15. In this regenerator 12, the moisture child in a lithium bromide solution disappears by the actuation heat-source distribution control of the fuel cell 30 and the compression equation heat pump 20 mentioned later. The lithium bromide solution condensed and reproduced is returned to an absorber 11 through the heat exchanger 16 by this. In addition, in the heat exchanger 16, heat is received and passed to the low-temperature attenuation solution which faces to a regenerator 12 from the hot concentration solution which came out of the regenerator 12.

[0010] The moisture child who disappeared from the lithium bromide solution of the regenerator 12 is led to a condenser 13, is condensed, and is seen off in an evaporator 14 through a pressure reducing pressure control valve 17 after that.

[0011] The compression equation heat pump 20 consists of refrigerant circuits 25 which connect annularly a compressor 21, a condenser 22, a pressure reducing pressure control

valve 23, and an evaporator 24 one by one. Water (condensation nature fluid which assumes the liquid phase by room temperature ordinary pressure) is used for the refrigerant for compression equation heat pump which circulates through this circuit 25 like the above-mentioned absorption type heat pump 10.

[0012] A condenser 22 consists of heat transfer coils, and in the hot water storage tank 10, as it goes downward from a top, it is held. The atmospheric-air disconnection way 26 is established in the refrigerant circuit 25 between this condenser 22 and pressure reducing pressure control valve 23. By this, the discharge pressure of the compressor 21 of pressure ****** of the condenser 22 is an atmospheric pressure.

[0013] Moreover, the air (non-condensable gas) of the external world is mixed in the refrigerant service water of the refrigerant circuit 25 from the atmospheric-air disconnection way 26. The refrigerant service water of this air mixture is injected into the lower part of the evaporator 24 which makes the shape of a tank through a pressure reducing pressure control valve 23, and is stored in an evaporator 24.

[0014] This evaporator 24 and fuel cell 30 are connected by direct ****** 31. That is, direct ****** 31 which consists of a heat transfer coil is held in the fuel cell 30. The upper end of this direct ****** 31 stands in a row in the interior space of the evaporator 24 lower part through a pump 32, and the downstream end stands in a row in the interior space of the evaporator 24 upper part.

[0015] In the heat pump system S1 constituted as mentioned above, the action which carries out heat actuation of the absorption type heat pump 10 by the fuel cell 30 and the compression equation heat pump 20 is explained. Actuation of the compressor 21 of the compression equation heat pump 20 will circulate water (refrigerant for compression equation heat pump) along a circuit 25. This water becomes negative pressure in the downstream of a pressure reducing pressure control valve 23, as a result an evaporator 24 by attraction operation of a compressor 21. Evaporation is promoted from the free oil level in an evaporator 24 by this.

[0016] Moreover, the air mixed in water also becomes negative pressure. By this, air can be certainly made being un-saturated. This non-saturated air serves as much blowholes, and goes up the core of the water (liquid phase) of an evaporator 24. A surrounding moisture child will disappear in the blowhole which is not saturated in the middle of this lifting. That is, in an evaporator 24, evaporation occurs also in underwater only from a free oil level. This can increase evaporation.

[0017] Furthermore, by actuation of a pump 32, some water (liquid phase) of the evaporator 24 lower part is incorporated into ****** 31, and it is led to the fuel cell 30. Exhaust heat of the fuel cell 30 is received directly, and it is warmed by this. Then, it is returned to the upper part of an evaporator 24, and is mixed with the remaining water in an evaporator 24. As a result, exhaust heat of the fuel cell 30 can be incorporated in an evaporator 24 without futility, and ******** can

be raised. And the evaporation of the water in an evaporator 24 can be increased further.
[0018] in addition, adjustment of a compressor 21 or a pressure reducing pressure control valve 23 -- the pressure V24 of an evaporator 24 -- the fuel cell 30 -- warming -- it is set up to become higher than the maximum vapour tension (VS = about 0.2 atmosphere) to next water temperature (about 60 degrees C). since air is especially mixed in the water of an evaporator 24, only the part is certainly set to V24>VS -- V -- it is 24 = about 0.3 atmosphere. Therefore, the pressure V31 (**V24) of ****** 31 is also higher than the maximum vapour tension VS. Therefore, water does not boil within ****** 31. As a result, ******** from the fuel cell 30 of water is highly maintainable certainly.
[0019] A lot of steam obtained with the evaporator 24 is inhaled by the compressor 21. Since air is also contained in this intake air, a compression ratio becomes small. Thereby, a compressor 21 can be miniaturized.
[0020] Above-mentioned intake air is breathed out from a compressor 21 to a condenser 22. And in the process in which a condenser 22 is passed, steam condenses and the heat of condensation is generated. This heat of condensation is supplied to the regenerator 12 of the absorption type heat pump 10. Since steam is abundant, the heat of condensation is also abundant, and a regenerator 12 can fully be warmed by this. And since the gas molecule of water has the big latent heat, it can enlarge the heat of condensation further and can make a regenerator 12 an elevated temperature further. As a result, a lot of moisture children can be evaporated from the lithium bromide solution of a regenerator 12, and a lithium bromide solution can be reproduced to high concentration. Thus, by the compression equation heat pump 20, the heat of the low temperature (about 60 degrees C) of the fuel cell 30 is pumped up to the actuation temperature (about 80 degrees or more) of the absorption type heat pump 10, and can drive the absorption type heat pump 10.
[0021] The above-mentioned high-concentration lithium bromide solution is sent to an absorber 11. Thereby, from an evaporator 14, so much, it can evaporate and a moisture child can be absorbed. Therefore, a lot of latent heat can be taken from an evaporator 14, it can cool further, and cooling efficiency, i.e., an output, can be raised greatly.
[0022] Next, the 2nd embodiment of this invention is explained according to drawing 2 . In this 2nd embodiment, about the architecture which overlaps the 1st embodiment of the above, the same code is given to Drawings and description is omitted. In the heat pump system S2 concerning the 2nd embodiment, as a low-temperature heat source, it replaces with the fuel cell 30 and the solar battery solar collector 33 is used. It lets direct ****** 31 pass inside the solar collector 33. A solar collector 33 warms the water (refrigerant for compression equation heat pump) which passes ****** 31 by carrying out the collection of heat of the solar heat at almost same about 60 degrees C as the fuel cell 30.
[0023] This invention is not limited to the above-mentioned embodiment, but various forms can

be used for it. For example, heat actuation heat pump may be a VERUMIE refrigerating machine besides an absorption type heat pump etc. Others, a helium, nitrogen, etc. are sufficient as a non-condensable gas. [air] In the compression equation heat pump 20, an impregnation way is put in a row to an evaporator 24, and the non-condensable gas of a non-saturated state may be made to be poured in into the liquid phase refrigerant of an evaporator 24 directly from this impregnation way. In this case, it is good by forming a vapor-liquid-separation machine in the downstream end of a condenser 22, or giving vapor-liquid-separation performance to the condenser itself to separate from a refrigerant the non-condensable gas which took a round of heat pump 20. The separated non-condensable gas may be released to atmospheric air, and may be made to be incorporated into the above-mentioned impregnation way. A compressor is formed between a regenerator 12 and a condenser 13, and a moisture child (molecule of the refrigerant for absorption type heat pumps) may be made to evaporate in a large quantity more from a lithium bromide solution by attraction operation of the regenerator 12 by this compressor in the absorption type heat pump 30. Moreover, you may make it water (refrigerant for absorption type heat pumps which consists of fluid which assumes the liquid phase by room temperature ordinary pressure) evaporate also in this gas by pouring in non-condensable gases, such as air, into the lithium bromide solution of a regenerator 12.

[0024]

[Effect of the Invention] As explained above, after according to this invention leading the refrigerant of compression equation heat pump to low-temperature heat sources, such as a fuel cell and a solar collector, and warming it directly by direct ******, it can return to an evaporator, the futility of heat can be lost, and ******** can be raised. As a result, the heating value for actuation of heat actuation heat pump can be increased, and an output can be raised.

[0025] By using water as a refrigerant of compression equation heat pump, the steamy latent heat can be enlarged, as a result the output of heat actuation heat pump can be raised further.

[0026] In compression equation heat pump, by mixing non-condensable gases, such as air, in the refrigerant which consists of condensation nature fluid which becomes the liquid phase by room temperature ordinary pressure, such as water, the compressibility of a compressor can be lowered and the miniaturization of a compressor can be attained. Moreover, the evaporation in an evaporator can be increased further, as a result the output of heat actuation heat pump can be raised further.

[0027] the pressure of the evaporator of compression equation heat pump -- a heat source -- warming -- by setting up becoming higher than the maximum vapour tension to the temperature of a next refrigerant, a refrigerant can be prevented from evaporating within direct ******, and ******** can be maintained highly certainly.

[Brief Description of the Drawings]

[Drawing 1] It is the outline architecture figure showing the heat pump system concerning the 1st embodiment of this invention.

[Drawing 2] It is the outline architecture figure showing the heat pump system concerning the 2nd embodiment of this invention.

[Explanations of letters or numerals]

S1, S2 Heat pump system

10 Absorption Type Heat Pump System

20 Compression Equation Heat Pump

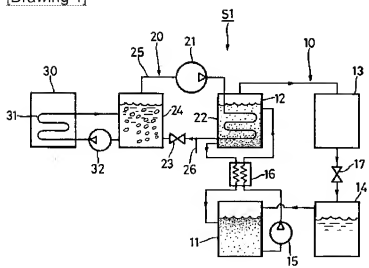
24 Evaporator

30 Fuel Cell (Heat Source)

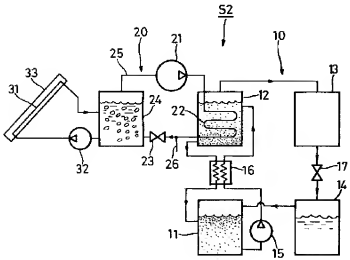
31 Direct ******

33 Solar Collector (Heat Source)

[Drawing 1]



[Drawing 2]



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